Unix File System Calls

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Points to be Covered

- File System Calls (Contd.)
  - dup
  - dup2
  - chmod
  - chown
  - link
  - unlink

dup() system call

The dup() system call creates a copy of the file descriptor oldfd, using the lowest-numbered unused file descriptor for the new descriptor.

Syntax: int dup(int oldfd);

Return Value: On success, these system calls return the new file descriptor. On error, -1 is returned.

dup() system call

```
#include<stdio.h>
#include <unistd.h>
#include <fcntl.h>

int main()
{

   int file_desc = open("dup.txt", O_WRONLY | O_APPEND);
    if(file_desc < 0)
       printf("Error opening the file\n");

   int copy_desc = dup(file_desc);

   write(copy_desc,"This will be output to the file named dup.txt\n", 46);
   write(file_desc,"This will also be output to the file named dup.txt\n", 51);
    return 0;
}
```

dup2() system call

The dup2() system call performs the same task as dup(), but instead of using the lowest-numbered unused file descriptor, it uses the file descriptor number specified in newfd. If the file descriptor newfd was previously open, it is silently closed before being reused.

Syntax: int dup2(int oldfd, int newfd);

Return Value: On success, these system calls return the new file descriptor. On error, -1 is returned.

dup2() system call

```
#include<stdlib.h>
#include<unistd.h>
#include<stdio.h>
#include<fcntl.h>

int main()
{
   int file_desc = open("tricky.txt",O_WRONLY | O_APPEND);

   dup2(file_desc, 1) ;

   printf("I will be printed in the file tricky.txt\n");

   return 0;
}
```

dup() and dup2() system call

```
#include<stdlib.h>
#include<unistd.h>
#include<fcntl.h>

int main()
{
    int fd1, fd2;
    fd1 = open("txt1.txt", O_RDONLY | O_CREAT, 777);
    close(1);   /* close standard output */
    dup(fd1);
}
```

dup() and dup2() system call

```
#include<stdlib.h>
#include<unistd.h>
#include<fcntl.h>

int main()
{
    int fd1, fd2, fd3;
    fd1 = open("txt1.txt", O_RDONLY | O_CREAT, 777); //3
    fd2 = open("txt2.txt", O_RDONLY | O_CREAT, 777); //4

    //close (fd2);
    fd3=dup2(fd1, fd2);
}
```

chmod system call

- The **chmod** command is used to change the access mode of a file.
- Syntax: chmod [reference][operator][mode] filename
- The references are used to distinguish the users to whom the permissions apply i.e. they are list of letters that specifies whom to give permissions.

Reference	Class
u	owner
g	group
o	others
a	all

chmod system call

The operator is used to specify how the modes of a file should be adjusted. The following operators are accepted:

Operator	Description
+	Adds the specified modes to the specified classes
-	Removes the specified modes from the specified classes
=	The modes specified are to be made the exact modes for the specified classes

chmod system call

- The modes indicate which permissions are to be granted or removed from the specified classes. There are three basic modes which correspond to the basic permissions:

Mode	Description
r	Permission to read the file
w	Permission to write (or delete) the file
X	Permission to execute the file, or, in the case of a directory, search it.

chmod system call

- rw- rw- r-- CSIS CSIS text1.c
- rw- rw- r-- CSIS CSIS text2.c
- rwx rwx r-x CSIS CSIS BITS
- rw- rw- r-- CSIS CSIS semaphore.c
- rwx r-x r-x CSIS CSIS xyz.c

BEFORE: - rw- rw- r-- CSIS CSIS text1.c

COMMAND: chmod u=r text1.c

AFTER: - r-- rw- r-- CSIS CSIS text1.c

chmod system call

Let's restrict the permission such that the user cannot search the directory BITS.

- rw- rw- r-- CSIS CSIS text1.c
- rw- rw- r-- CSIS CSIS text2.c
- rwx rwx r-x CSIS CSIS BITS
- rw- rw- r-- CSIS CSIS semaphore.c
- rwx r-x r-x CSIS CSIS xyz.c

BEFORE: drwxrwxr-x CSIS CSIS BITS

COMMAND: chmod u=rw BITS
or: chmod u-1 BITS

AFTER: drw-rwxr-x CSIS CSIS BITS

chown system call

- The **chown** command changes the user and/or group ownership of a given file..

- Syntax
  - chown owner-user file
  - chown owner-user:owner-group file
  - chown owner-user:owner-group directory

chown system call

First, list permissions for demo.txt, enter:

ls -l demo.txt

Sample outputs: -rw-r--r-- 1 root root 0 Aug 31 05:48 demo.txt

In this example change file ownership to vivek user and list the permissions, run:

- chown vivek demo.txt

ls -l demo.txt

Sample outputs:

- -rw-r--r-- 1 vivek root 0 Aug 31 05:48 demo.txt

chown system call

Now, the owner is set to vivek followed by a colon and a group onwership is also set to vivek group, run:

chown vivek:vivek demo.txt

ls -l demo.txt

Sample outputs:-rw-r--r-- 1 vivek vivek 0 Aug 31 05:48 demo.txt

chown system call

Here, we have changed only the group of file. To do so, the colon and following GROUP-name ftp are given, but the owner is omitted, only the group of the files is changed:

chown :ftp demo.txt

ls -l demo.txt

Sample outputs:

-rw-r--r-- 1 vivek ftp 0 Aug 31 05:48 demo.txt

link() system call

link - make a new name for a file

Syntax: **int link(const char **oldpath*, const char **newpath*)**

- **link**() creates a new link (also known as a hard link) to an existing file.
- If *newpath* exists it will *not* be overwritten.
- This new name may be used exactly as the old one for any operation; both names refer to the same file (and so have the same permissions and ownership) and it is impossible to tell which name was the `original'.

Return Value: On success, zero is returned. On error, -1 is returned.

link() system call

- link ("/usr/src/uts/sys", "/usr/include/sys");
- link ("/usr/include/realfile.h", "/usr/src/uts/sys/testfile.h");

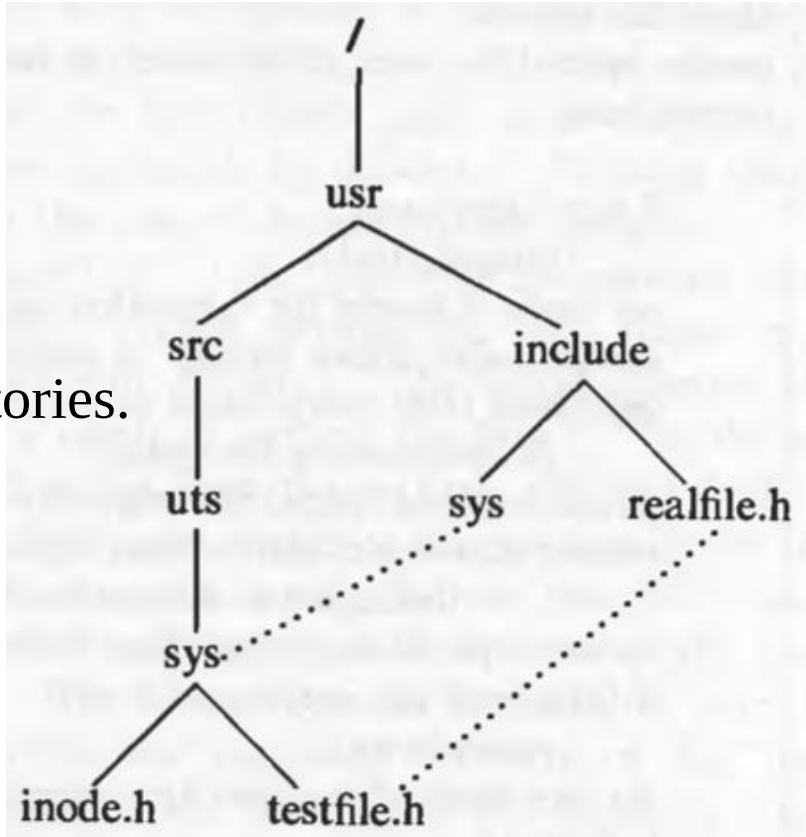
- 3 pathnames refer to the same file:

"/usr/src/uts/sys/testfile.h",

"/usr/include/sys/testfile.h",

"/usr/include/realfile"

- Only a superuser is allowed to link directories.



unlink() system call

unlink - delete a name and possibly the file it refers to

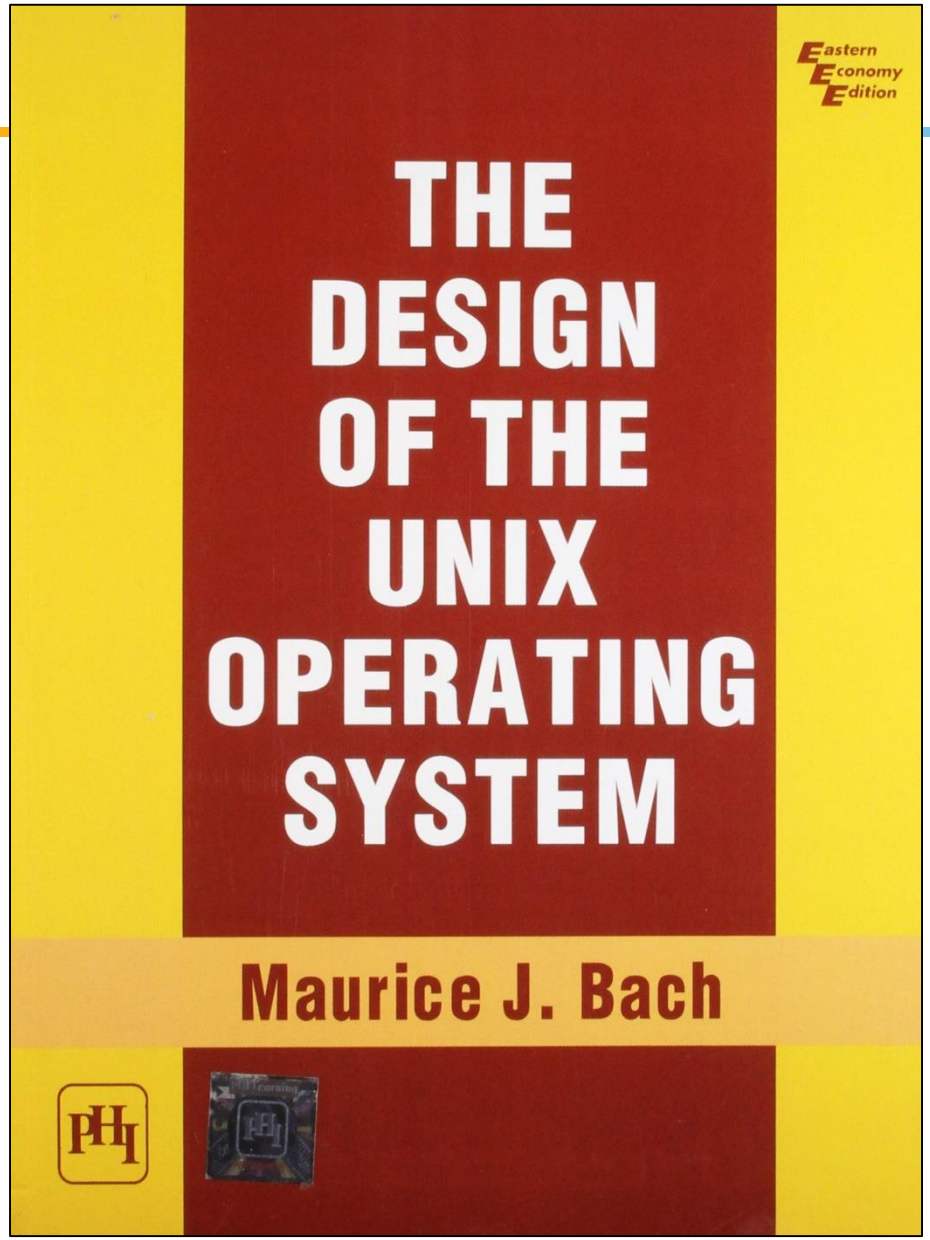
Syntax: **int unlink(const char **pathname*);**

Return Value: On success, zero is returned. On error, -1 is returned, and *errno* is set appropriately.

- unlink() deletes a name from the filesystem. If that name was the last link to a file and no processes have the file open, the file is deleted and the space it was using is made available for reuse.
- If the name was the last link to a file but any processes still have the file open, the file will remain in existence until the last file descriptor referring to it is closed.

Problem 1

Assume that the text file is already created. You need to open the file using O_RDWR flag only and print “hi All” from the program without use any printf or cout function.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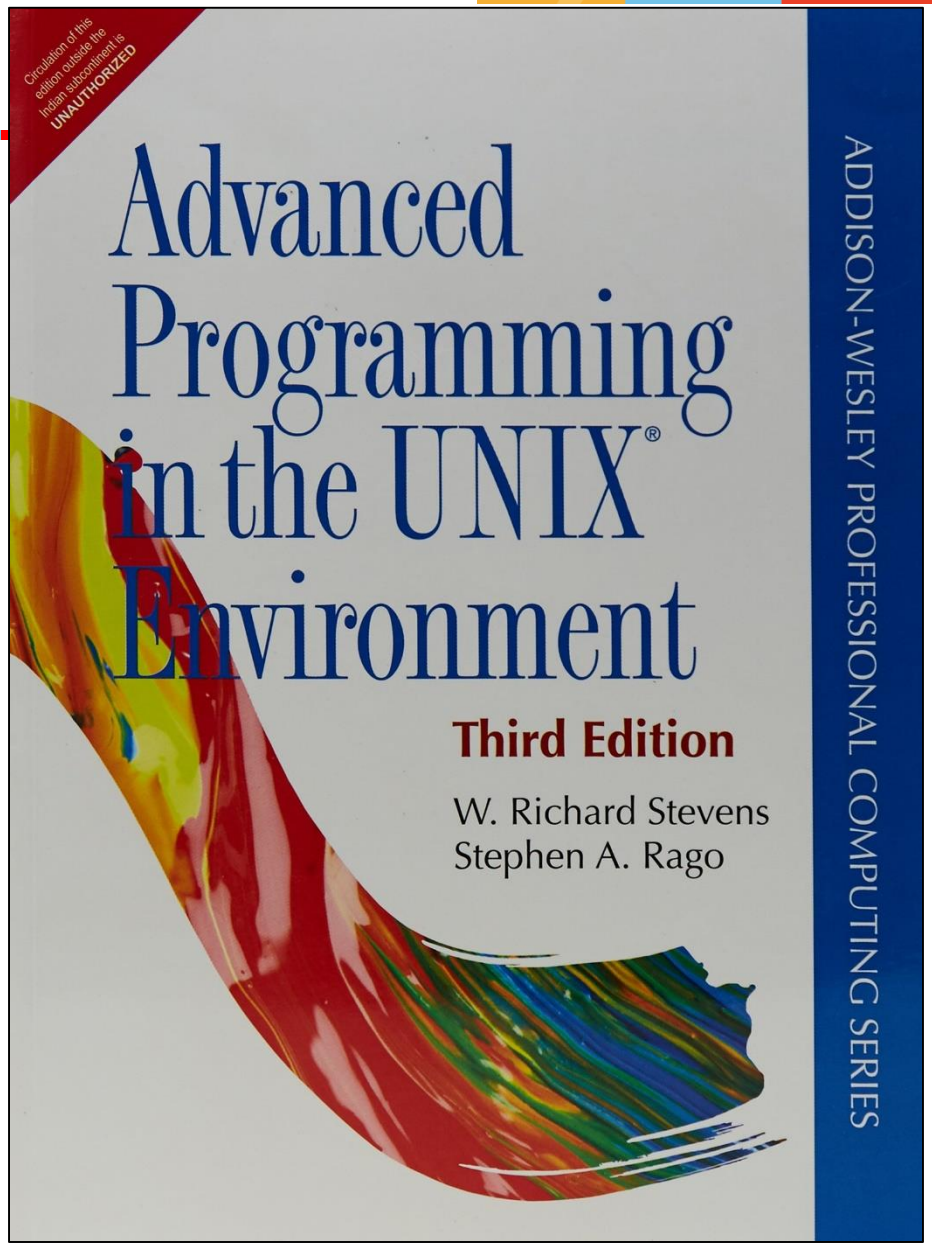
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